Mammalian peripheral nervous system

The Peripheral Nerve. Edited by D. N. Landon. Pp. xii+836. (Chapman and Hall: London, 1976.) £25.

VARIOUS aspects of present knowledge about the mammalian peripheral nervous system are reviewed in this book, special emphasis being placed on fine structure, and on the nature of the relationships that exist between the neurone and its supporting cells, end-organs, and other surrounding tissues.

The first nine chapters deal with the functional morphology of the myelinated nerve fibre (D. N. Landon and S. Hall); unmyelinated nerve fibre (J. Ochoa); perineurium and connective tissue (F. N. Low); sensory ganglia (A. R. Lieberman); anterior horn motoneuron (S. Conradi); spinal and cranial nerve roots (H. J. Gamble); ganglia of the autonomic nervous system (G. Gabella); sensory terminals (L. H. Bannister); and motor end-plates (G. F. Gauthier). The remaining chapters review motor end-plate function (A. J. Buller); chemistry and structure of myelin (N. A. Gregson); histochemistry of peripheral nerves and nerve terminals (J. F. Hallpike); selected aspects of peripheral nerve pathology (G. Allt); and electrophysiological properties of peripheral nerve (J. J. B. Jack).

This comprehensive survey, with its extensive bibliographies and superb illustrations, will provide a valuable reference work for those engaged in research on the mammalian peripheral nervous system. Naturally, in a work of such length and scope and varied style some parts appeal more than others. For me the authoritative reviews on myelinated and unmyelinated axons, and on the nerve sheaths, are among the most interesting and useful contributions. There is also an excellent account of Wallerian degeneration and subsequent regeneration (excluding reinnervation), and an admirably comprehensive review of receptors.

The editor is to be congratulated for embarking on such a worthwhile enterprise and bringing it to a successful conclusion. There are signs, however, that active and critical editorship was sometimes lacking. For example, the consecutive chapters on motor end-plate structure and function should have been edited so that one complements the other. As it is, no functional comment is made on much of the ultrastructural information; "tonic" and "slow" muscles in one are respectively "slow" and "slow-twitch" in the other; references to "Normanski" optics in the chapter on function remain uncorrected; and the use of the term *"en grappe"* is left in unnecessary confusion. Another contributor is allowed to depict a periaxial space in the Golgi tendon organ, and to present a bizarre account of muscle–spindle innervation in which, for example, the secondary sensory endings are supplied by "group IIa" afferents, and a collateral motor innervation is derived from axons belonging to "group IIb". The editor certainly knows better than this; perhaps it is his view that an editor should do little more than serve as the channel through which his sources flow freely and unfiltered from pen to print. At times that way can leave the reader floundering.

The book, over 800 pages long, is heavy (1.5 kg) to handle and at times heavy to digest. Paragraphs sometimes run on far too long and occasionally there is a rash of instructional italics. Publication evidently took three years, writing being mostly completed by 1973, although an effort has been made to update references to 1975. It might have been better to have published the work in two volumes; better still to have included other aspects and run to three. The value of a well-documented survey of this standard would certainly have warranted that.

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Heat on the move

Thermal Conduction in Solids. (Oxford Studies in Physics.) By R. Berman. Pp. xi+193. (Clarendon: Oxford; Oxford University: London, December 1976.) £9.75.

EVERY now and again one happens gratefully on a monograph born purely of the author's desire to communicate, to distil the fruits of a lifetime's personal interest and research into a form which renders the topic accessible to a wider audience. This is just such a book. Our present relatively mature understanding of the mechanisms of thermal conduction in solids owes much to a steady succession of illuminating experiments carried out during the past thirty years by Dr Berman and his coworkers; so that, being a gifted expositor, he is particularly well fitted to convey to others some of his continuing fascination with this technologically important subject.

The book is aimed mainly at physics graduates (or, indeed, final-year undergraduates) who want to progress beyond the rather limited discussion of thermal conduction usually provided by general textbooks on solid-state physics, but who lack the stamina necessary to tackle the unusually abstruse symbolism of the monumental work by J. M. Ziman (*Electrons and Phonons*, Clarendon, 1960). Throughout, Dr Berman's emphasis is very much towards conveying an understanding of the topic in question, and he has eschewed the algebraic pendantries which, in the name of rigour, can so easily obscure the physics for most readers. The dustcover's description of his treatment as "detailed but uncomplicated" is entirely apt.

The book opens with an explanation of what the thermal conductivity coefficient is, how it is measured, and the general way in which it behaves for a variety of different materials. The next six chapters, dealing with conduction in non-metals, include discussions of phonons, phonon-phonon interactions, the scattering of phonons by defects, the Boltzmann equation and methods for solving it; and they explain how these concepts and techniques are able to account for the features of conduction observed in nearly perfect crystals, imperfect crystals, and amorphous materials. Of particular note are the sections which explain the subtle influence of normal (momentum-conserving) processes, Poiseuille flow of the phonon gas and a number of interesting resonant phonon-scattering mechanisms. These are topics which in most textbooks are dealt with either cursorily or not at all. The second half of the book deals lucidly with situations in which heat is transported by electrons, discussing the effect on the conductivity of various types of electron scattering in metals and alloys including superconductors, and in semiconducting materials.

The deliberate emphasis towards a description of work below room temperature is justified by the fact that such experiments usually provide a more sensitive test of the theory than is afforded by those carried out at higher temperatures. An extensive set of references to original papers is provided, and will enable readers to follow up particular aspects of earlier work which are of interest or of relevance to their own research. Books and review articles are also cited where they are likely to be helpful.

Dr Berman's well integrated and readable little monograph has filled what—with hindsight—was an obvious lacuna in the literature. It will continue to be of value for many years to come.

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